THE CENTER

U.S. Department of Agriculture
Agricultural Research Service
The Western Regional Research Center
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Albany, CA 94710

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Plant Factories

Scientists at the Western Regional Research Center (WRRC) are using the tools of biotechnology to find new ways of utilizing plants. The goal of this type of research is to use crop plants as factories to create high-value substances. This issue of The Center highlights two projects aimed at creating novel compounds with potential food and non-food uses.

WRRC is seeking private companies interested in becoming our partners in Cooperative Research and Development Agreements (CRADAs) for these projects. CRADA partners have the first right to negotiate an exclusive license for each invention which is made as part of the CRADA. We encourage small and minority-owned business to take part in our technology transfer programs.

Development of Field Crops Producing High-Value Oils

Vegetable oils derived from U.S. grown crops serve food and industrial uses. U.S. grown crops currently produce vegetable oils with significant quantities of only five common fatty acids. WRRC is developing transgenic plants to produce commercial levels of other fatty acids for food and non-food uses. These transgenic crops would be renewable resources that could provide replacements for products now derived from fossil fuels and other sources.

Currently, the fatty acid ricinoleate serves strategic needs of the U.S. military as a source of aviation lubricant and engineering plastics. It also has numerous commercial uses. Castor oil, the source of this fatty acid, is imported and expensive. There is no domestic crop that produces ricinoleate.

Scientists at WRRC have established the biosynthetic pathway for castor oil, and are identifying the key steps necessary to maximize production of ricinoleate. They are using these results to design molecular approaches that elicit high levels of ricinoleate in transgenic field crops such as canola and soybean.

Another commercially useful fatty acid, vaccentate, is produced by milkweed, a new fiber crop. Vaccenate can be a chemical source for making bio-degradable plastics. WRRC researchers have identified the biochemical basis for vaccenate production in milkweed, and are developing the technology needed to enhance vaccenate production in milkweed and eventually in other crops.

The enzymatic action of the milkweed enzyme also converts palmitate to palmitoleate. Future plans at WRRC involve transferring the gene for the milkweed enzyme into soybean to reduce palmitate levels, thus enhancing the desirability and health benefits of soybean oil for food use.

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Modifying Starch in Cereals for Food and Non-Food Uses

Scientists at WRRC in Albany, California are also conducting genetic engineering research aimed at altering the physical properties of the starch produced in the wheat kernel without affecting the starch metabolism elsewhere in the plant.

Genes encoding the starch branching enzymes have been cloned and are being inserted into wheat in an attempt to modify the normal starch biosynthetic pathway. The gene constructs utilize a promoter from the wheat glutenin seed-storage gene that ensures selective expression of the inserted gene in the endosperm of the developing grain. The goal is to modify the natural starch branching pattern so that starch or flour produced from transgenic grain will be superior for specialized food and non-food applications.

This technology could also be applied to corn, rice and other starch producing plants. It may one day make it possible to produce "designer starches" with very specific functional properties.

WRRC has filed a provisional patent application on genetic modification of starch branching patterns in cereal grains.

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WRRC Patent Activity February 1998 -- May 1998

U.S. Patents Issued:

March 31, 1998, No. 5,734,046
Method for Manufacturing Limonoid Glucosides
Inventors: Shin Hasegawa
Yasushi Ifuku
Hisao Maeda
Masaki Miyake
Shigeru Ayano
Kazuyuki Maruyama

U.S. Patent Applications Filed (Provisional):

March 31, 1998
Serial No. 60/080,166
Monoclonal Antibodies against Campylobacter jejuni and Campylobacter coli Outer Membrane Antigens
Inventors: Robert Mandrell
David Brandon
Ann Bates

Licenses Granted:

Monoclonal Antibodies to Potato, Tomato and Eggplant Glycoalkaloids and Assays for the Same; granted to EnviroLogix Inc., Portland, Maine; April 14, 1998
Inventors: Mendel Friedman
Larry H. Stanker

WRRC Seeks New Director

Antoinette A. Betschart, former Director of WRRC was appointed Area Director, Pacific West Area on November 2, 1997. The U.S. Department of Agriculture is currently seeking a highly qualified individual for the position of Center Director, WRRC. This position requires a background in research and management and the leadership skills necessary to guide the complex and diverse programs of WRRC. The closing date is June 19, 1998.

For more information contact: Lee Triplett, USDA/ARS/AFM/HRD, Policy Branch; Tel.: (301) 504-1475, and request Announcement Number: ARS-SES:98-1

Anyone interested in discussing the position and its responsibilities in more detail should call:
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The Center is a quarterly newsletter compiled by WRRC to alert potential partners of technology transfer opportunities.

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